NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS

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S E T T I N G U P T H E F M S T A T I O N

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THE FM PICTURE FOR EDUCATIONAL INSTITUTIONS

Right now, educational institutionshave an opportunity to get into radio and own their own stations, that may never be duplicated again. With the standard broadcasting band bursting at the seams, Frequency Modulation is the college's hope. Twenty channels, ranging from 88,100 kilocycles to 91,900 kilocycles, with a two hundred kilocycle separation, are reserved for the exclusive use of non-commercial educational agencies. Rules and requirements for such agencies are much less exacting than those required by the Federal Communications Commission of commercial broadcasters. Furthermore, these educational bands are not crowded just now. There is the danger, however, that unless more interest is shown in these frequencies in the future, some may be taken away from educators and allotted to commercial interests, which are applying in great numbers for construction permits on the other portions of the FM band.

WHERE TO PLACE THE STATION

For truly efficient operation, the studios, transmitter, and antenna should be located at the same point. The studios and transmitter should be located in the same layout (a) to avoid the maintenance of two sets of engineers and the occupancy of two sets of real estate, and (b) because the conventional telephone circuits used to transmit AM programs from studios to transmitter are inadequate for FM, and specially engineered circuits that will retain the FM frequency range would be prohibitive in cost for the usual educational organization.

The antenna must be placed very close to the transmitter because there is a high loss in the co-axial cables used to convey the high frequencies between transmitter and antenna. While the losses vary according to power, size of cable, etc., it can be safely assumed that if the antenna is as much as 500 feet away from the transmitter, half the power of the latter will be lost by the time it reaches the antenna. Since the co-axial cable must be long enough to reach the antenna on the top of its tower, it stands to reason that a transmitter and studio location at the base of the tower is ideal. If your campus is located on a hill or even a hump, consider the use of the highest building, or rather the highest floor, on the campus for your purpose.

MINIMUM STUDIO REQUIREMENTS

For strictly broadcasting purposes you will require a control room at least 20 feet square; a studio the same size adjoining the control room; and an announcer booth 5 feet by 10 feet also adjoining the control room. Your offices will not require the high space if it is not readily available. The control room, studio, and announcer booth must have separate corridor entrances, and large double or triple glass windows (with the panes set non-parallel) should give visibility from the control room to the other two units. It is best for the announcer's booth and studio to abut the control room on two adjoining, and not two opposite walls. Entrance to the booth and studio should be made by small corridors so that two sound-proof doors, constituting an efficient sound-lock, may be set up. Your own building or maintenance department can no doubt construct these doors, as well as double the walls surrounding the studio and announcer booth.

As far as accoustical treatment of these units is concerned, don't let it worry you. Secure some accoustical celotex in the usual foot square blocks. Have this applied solidly to the ceiling and over three-fourths of the wall space, using care not to leave uncovered areas directly opposite. The uncovered areas, plus the doors and windows, will give the studio enough "bounce" but you will still have adequate absorption. For the floors, use any type of tile linoleum. Accoustical experts may writhe at the simplicity of the accoustical problem as I have solved it, but it will work well for most small and medium sized units. Your control roon should also have some accoustical treatment. Apply the accoustical celotex to the ceiling and the top half of each wall first. If that doesn't give you enough absorption, additonal blocks of accoustical tile can be quickly glued on.

Now back to the location again. If your college is unfortunately located in a depression, you'd better look for a location on the top floor of the highest building in your town and ignore the campus. After all, your space requirements are not excessive, and the rent of the necessary room should not be too high. However, if a location at or near a high point in your community is impossible, give up your FM ideas.

As long as your station is at or near the highest point in your vicinity the location doesn't have to be much higher than the surrounding land. If your topography is gently rolling and you can see out a mile or so from the roof of the building you select to house the station, the chances are that the visibility will be extended several miles from the top of the tower itself. Since the radio waves will easily cross two or more gentle horizons, your station, if operating on low power, will likely give service to all the area it supposed to.

EQUIPMENT AND COSTS

If you are going into FM for the first time, I'd recommend that your transmitter be a 250 or 1,000 watt job--no higher. Most FM transmitters are so constructed that additional power units may be added to the basic unit, so you'd do well to start with a lower power and see just what coverage you'll get. Perhaps your lower-powered transmitter will do all you want.

Furthermore (and FM transmitter manufacturers are not going to like this) the FM transmitter design isn't too well stabilized as yet, and a heavy investment now may prove unwise if the transmitter becomes obsolete in a year or two. Think seriously of having your own Engineering College build the transmitter if you have a faculty member or advanced student sufficiently talented and ambitious. It has been done, and to the institution's complete satisfaction; but in case you want a factory job, a 250 watt FM transmitter will cost around $5,500.

With the transmitter you'll need a combination frequency and modulation moniter. This is required by the FCC, and you'll not find anyone in your institution that will want to build one. The cost of a good one will be around $850.

For speech input equipment and microphones, I strongly recommend getting good, standard items. The use of home-made equipment or attempts to adapt public-address system amplifiers and microphones are serious mistakes. Don't do it! The desirable equipment to control one studio, one announcer booth, remotes, and recordings, with prices, is as follows:

1 multi-studio console, including line amplifier, monitor amplifier, seven pre-amplifiers	$1,150.00
3 high quality microphones, stands and cords	320.00
2 medium quality microphones, stands and cords	100,00
Plugs and outlet sockets for microphones	25.00
1 remote outfit	275.00
2 turntables, dual speed, lateral and verticle, complete	800,00
1 program rack	100.00
1 line equalizer	60.00
2 double jack panels	120,00
4 loudspeakers	250.00
Jack cords	30.00
1 monitor amplifier	100.00
Total cost of basic speech-input equipment	$3,330.00

The above equipment will adequately take care of usual needs. Later it might be desirable to add such equipment as an extra remote outfit, additional microphones, sound effects (filter) panel, and recording units.

Your antenna and antenna tower pose a problem when it comes to generalization. Although the higher the latter the better, there must be a limit as to what can be spent, and this will limit the tower's height. Suppose you are able to locate your studio on the topographical hump mentioned earlier in this article, and you can see out at least a mile from your roof. Let's be conservative, at least for a while, and let your maintenance department fabricate for you a 50-foot section of four-inch pipe, to be mounted on the roof directly over your transmitter and to be guyed to three points. Cost of tower and erection combined should not exceed $100.

Now for the type of antenna, let's appeal again to that faculty engineer or graduate student. Can he not figure out the dimensions of a four-bay turn-style antenna and build it himself? If not, try one of the engineers on your local radio station who'd like to make some extra money. Have him purchase some seven-eights inch copper refrigerator pipe with proper turn fittings. You ought to get the four-bay job done for $400 ($300 for labor and $100 for materials). In current radio magazines you'll see advertisements for more kinds of FM antenna system than you can dream up. Probably, all of them are serviceable, but the fact that they vary so widely in design is adequate proof that no one type is best, and for general purposes I believes that the four-bay turn-style, engineered to the proper dimensions,, will give complete satisfaction.

Now the transmission line, the gadget that connects the transmitter with the antenna, remains. For any powered FM transmitter up and including 3,000 watts, simply buy some more seven-eights inch hard copper tubing, some one-fourth inch flexible copper tubing, and some lava insulators. The electricians in your maintenance department can assemble this co-axial line as they put it up. Total cost of 100 feet, including materials and labor, should not exceed $100,

To recapitulate, the total cost, then, of setting up your FM station, excluding remodeling of building and accoustical treatment, would be as follows:

Trasmitter, 250 watts	$5,500.00
Combination frequency and modulation moniter	850.00
Speech-input equipment	3,360.00
Antenna and tower	500.00
Transmission line	100.00
Total	$10,000.00

Of course, if you already have radio studios, you can skip the speech-input item. Now, if these items haven't given you too much of a jolt, you can read on.

LICENSE PROCEDURE

Your next step is to send to the Federal Communications Commission, Washington, D.C., for three copies of Form 340, which is your application for a station construction permit. You must submit two copies and you'll want to keep one.

Let's study this form a little. Here are the questions that might trouble you;

1. Remember, the applicant is your institution, not you.
2. Here's where you put your name.
3. (c) This is for the name of your president. He's your executive officer.

You will note at the bottom of page 3 that your board of trustees or regents have to specifically authorize the application for a station.

Be careful to execute either Part II or Part III (whichever applies), but not both.

Be sure to answer "yes" to 18 (c)
Relative to 22 (a), request the FCC to assign you a channel before you apply.

If you are contemplating a transmitter built by a standard manufacturer, simply give the make and model number under 24, and answer the rest of these questions with the phrase "On File with the FCC." That goes for 25. Questions 26 and 27 can be answered by whomever you purchase the frequency and modulation monitor from. Whoever builds your antenna can help you with 28. I have virtually answered 29. Your civil engineering department and bureau of business research can combine forces on 30 and 31, and you can do the rest. On page 20, the line under the date must be the name of your institution. Your president, as executive officer, should sign on the line after "by". Indicate in answer 34 that your station will be completed within six months (keep your fingers crossed).

When you submit the application for the construction permit (Form 340) be an optimist and request three copies of the Application for License Form. You'll need this when your station is about ready to go on the air. Before that time you'll also want to purchase from the Superintendent of Documents, Washington, at the cost of 10 cents each, copies of parts 2, 3 and 4 of the rules of the Commission, to avoid transgressing the FCC mandates.

After submitting your construction permit application, some time may elapse before you get your grant, if it is in proper form, it will come through eventually. As soon as it does, write to the Civil Aeronautics Administration, Washington, for copies of their Form ACA 117. You should file this at once so you can be promptly informed as to how your antenna tower must be lighted and painted if its height requires that.

PROGRAMMING PLANS

You will be very wise if you start operations of your FM station with a modest schedule---one that you can maintain after the novelty for your talent has worn off. Here are some ideas for programs, other than those you locally produce, that you can obtain without charge:

Transcriptions---Adventures in Science---supplied weekly by Westinghouse
Transcriptions---American Medical Association
Transcriptions---"This is Puerto Rico" from the U.S. Office of Education
Transcriptions---"Alcoholics Anonymous" from WJR, Detroit
Transcriptions---Army enlistment office---features movie stars
Transcriptions---"The Treasury Salute"--U. S. Treasury Department
Transcriptions---Virtually all college AM stations have literally hundreds of transcriptions they will be glad to lend.

Rebroadcasts---Most AM radio stations willingly give permission to non-commercial FM stations to rebroadcast all of their non-network, sustaining programs. Write for such permission to all AM stations within good hearing of the projected FM station. Copies of the letters of permission must be filed with the FCC.

Rebroadcasts---Write to the British Broadcasting Company in New York for similar permission to rebroadcast the BBC overseas service. You'll need a good short-wave receiver to handle these programs.

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